J. Bequaert

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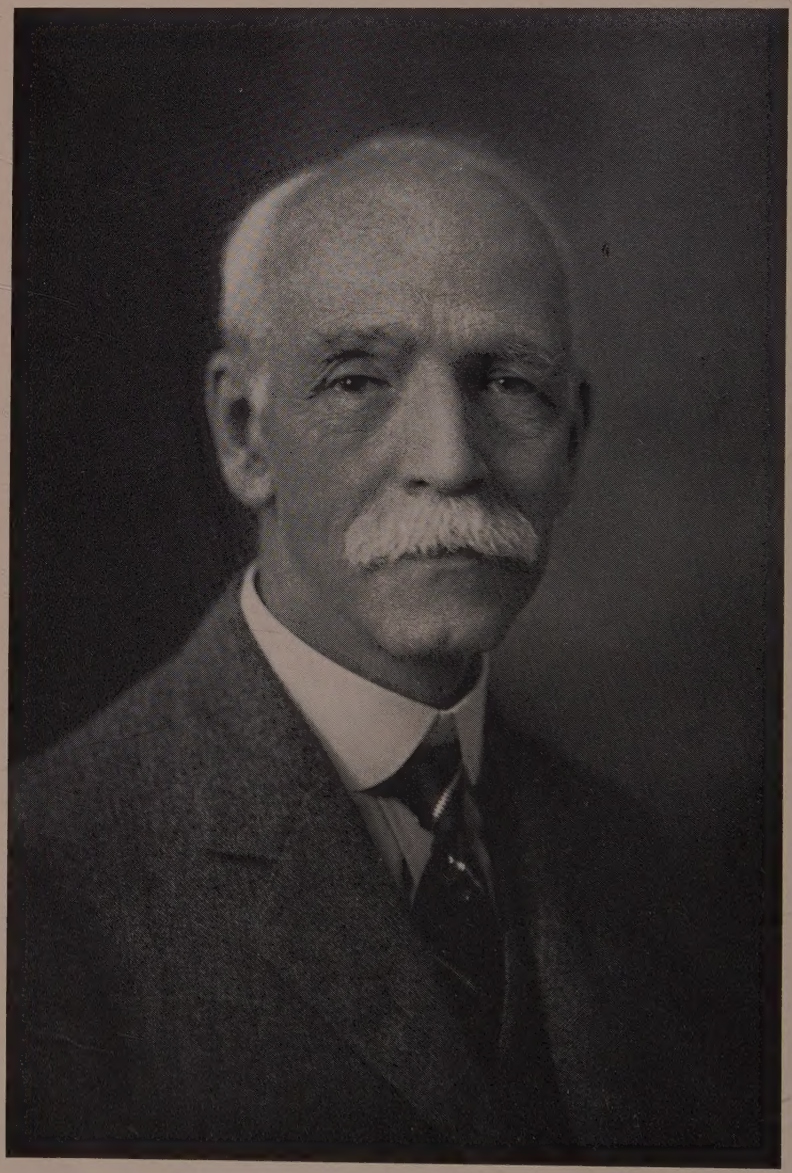

HENRY CLINTON FALL

PSYCHE

VOL. XLVII JUNE-SEPTEMBER, 1940 Nos. 2-3

HENRY CLINTON FALL (1862-1939)

Henry Clinton Fall was born December 25, 1862, at Farmington, New Hampshire. His father was Orin Tenney Fall, manufacturer, veteran of the Civil War, and member of the New Hampshire legislature. His mother was Mary Ann Hayes. Both were of good, old American stock.

Mr. Fall was educated in the public schools of Dover, New Hampshire, and at Dartmouth College, where he received the degree of B.S., at the head of his class, in 1884. Thereafter he taught physics and mathematics in Chicago, until, in 1889, his health became impaired. He went to California to recover and eventually resumed teaching there, first at Pomona and then at the Pasadena High school, where he taught physics and chemistry and was head of the science department for more than twenty years. He retired in 1917. After more than thirty years of notable work as a teacher, he returned to the East with his mother and made his home at Tyngsboro, Massachusetts with his sister, who had lately purchased the house in which his old friend and mentor, the coleopterist Frederick Blanchard, had lived. Mr. Fall continued his entomological work at Tyngsboro for more than twenty years. He died at home in the evening of November 14, 1939.

Mr. Fall had many interests. As a young man in college he excelled in baseball, and all his life he was keenly interested in baseball, tennis, and other athletic sports. He collected not only Coleoptera but Lepidoptera, stamps, postmarks, and old New England railway locomotive pictures. His valuable collection of these pictures is to be placed in the Railway and Locomotive Historical Society rooms in the Baker Library of the Harvard School of Business. But

it was as a coleopterist that Mr. Fall made his scientific reputation.

His sister has mentioned an important incident in connection with his turning seriously to Coleoptera. It was at Wakefield, Massachusetts, in the summer of 1878, when he was fifteen years old. He was already interested in natural history, and needed only some special stimulus to start him along one line or another of scientific work. The stimulus was provided by the capture of a fine Cerambycid beetle, *Prionus pocularis*, on July 17. The specimen is preserved and labeled in the Fall Collection, of which it was the beginning.

Since July 17, 1878, the Fall Collection has grown to well over one hundred thousand specimens in the main series of North American beetles, plus nearly one hundred thousand more in the Charles Liebeck Collection, which came to Mr. Fall a few years ago, plus thousands of exotic beetles, Lepidoptera, and other insects. There are about a quarter of a million specimens in all. The collection contains between 14,000 and 15,000 distinct, identified species of beetles from America north of Mexico. It is likely that this is nearly 90% of the good, distinct species now known from the region, although nobody knows just how many species there really are. Mr. Fall described 1,484 of the species himself, practically all unquestionably good. The types of most of them are in his own collection. He kept them in four Schmitt boxes, crowded together for quick rescue in case of fire. His main North American series fills 292 additional Schmitts. Besides his own types, there are many co- and paratypes of other workers, and innumerable specimens which Mr. Fall compared with the types of Leconte, Horn, and Casey. Such specimens are carefully labeled, and there is an accurate system of cross references from the labels to Mr. Fall's notebooks, and to his working set of 59 bound volumes of papers on North American Coleoptera. The whole collection is beautifully prepared and arranged.

Mr. Fall has left his entire mounted insect collection, together with his correspondence, notebooks, and numbered volumes of technical papers, to the Museum of Comparative Zoölogy at Harvard College, Cambridge, Massachusetts. The arranged North America beetles are to be kept as a

separate collection. The main series has already been installed in what has been the Leconte Room, now the Leconte-Fall Room. The collection will be kept as Mr. Fall left it, except that (as he wished) the types will be rearranged and, if practicable, put in the proper places in the main series, and some overflow material will be interpolated in additional boxes. The Leconte-Fall Room now contains an unexcelled collection of North American Coleoptera. In honor of Mr. Fall and in recognition of his work and of his collection a new department has been established in the Museum of Comparative Zoölogy, to be presided over by a Fall Curator of Coleoptera. The present writer has the privilege of being the first to bear this title.

The first paper published with the signature "H. C. Fall" appeared in *Entomological News* for September, 1893; the last, in the *Pan-Pacific Entomologist* for October, 1937. A complete bibliography is given below. There are 144 titles in all.

Mr. Fall's contributions to science include not only his splendid collection and his careful and extensive published work, but the influence which he had to the very last on coleopterists throughout the country. He was a friend and correspondent of practically every coleopterist from George Horn to graduate students of 1939. Frederick Blanchard and E. A. Schwarz were his first and closest entomological friends. It was a fortunate meeting with Mr. Fall that led Dr. Adalbert Fenyes to settle in California and to work on North American beetles. Charles Liebeck and John D. Sherman, Jr. are surviving friends of long association, and there are many others. The Sherman Dytiscidae formed the basis of much of Mr. Fall's work on water beetles, and Mr. Sherman has published a brief, intimate sketch of Mr. Fall's life in the *Journal of the New York Entomological Society* for March, 1940 (Vol. 48, pages 33-36). Mr. Liebeck retired from activity as a coleopterist on August 7, 1934, and, with generous appreciation of Mr. Fall's qualifications, he gave to Mr. Fall his large and beautiful collection. But perhaps even more important than his friendship with these and other well known coleopterists was Mr. Fall's tirelessness in encouraging and helping younger men, of whom the writer is one. His correspondence and identification work

were enormous, and he kept them up quite literally to the last day of his life.

Among the traits which qualified Mr. Fall for his work was his excellent memory. It is stated on good authority that he knew the old Henshaw List of 11,000 numbered names so well that, with no conscious memorizing, he was able to give from memory the serial number of practically every species on the list, and the name which went with practically every number.

All in all, Mr. Fall knew the whole of the Coleoptera of America north of Mexico as few persons have known them, and as few will ever know them in this age of increasing specialization. His knowledge and his work entitle him to stand in the direct line of succession of First Coleopterists of America: Leconte, Horn, and Fall.

Of course, his worth did not go unrecognized. He was a fellow of the American Association for the Advancement of Science (1927) and a fellow of the American Academy of Arts and Sciences (1930). He was one of the sixteen United States entomologists made members of the Permanent Committee of the International Congress of Entomology at its first meeting, at Brussels, in 1910. He was one of the founders of the Pacific Coast Entomological Society, temporary president at its first meeting, and later vice-president. And he belonged to several other entomological societies. In 1929 he received the honorary degree of Doctor of Science from Dartmouth College. The degree was richly deserved, but at the same time was quite unnecessary to enhance his reputation. He was already known and respected throughout the entomological world as "Mr. Fall", and it is by that familiar name that I have called him here. Under that name he earned the titles given him by various persons since his death: "beloved teacher", "friend", and "our most eminent worker on North American Coleoptera".

PHILIP J. DARLINGTON, JR.

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HILARA GRANDITARSIS, A BALLOON-MAKER

A. L. MELANDER

College of the City of New York

On July 31, 1935, while driving through the open forest near Moraine Lake, Alberta, I noticed some flies dancing a dozen feet above the ground in groups of four to eight among the spruce trees. The distinctive feature of this aerial dance was the white burden carried by some of the flies, which mysteriously glistened in the sunshine. Although the insects were flying out of reach of the net, now and then one would descend and in a short time some two dozen specimens were captured, all of them males. The species proves to be *Hilara granditarsis*, described by C. H. Curran in the Canadian Entomologist, 1926, page 248, from six specimens taken by Eric Hearle near Banff, Alberta, and recorded also as "swarming under trees". This habit of swarming in and out high up between the trees is rather unusual for Hilara, the numerous species of which are most commonly encountered dancing close to water.

The glistening oval bit of frothy matter carried by the flies is conspicuous in contrast with the blackish bodies of the insects hovering with it, and in bulk is even larger than the flies. When caught, the flies dropped the balloon, which is extremely delicate. On drying, the web collapsed and shrunk almost to nothing, and when put into alcohol quickly disintegrated.

In Europe, *Hilara sartor* has similar habits, which have been witnessed and commented upon by many entomologists. This species likewise is found in coniferous forests in the higher altitudes, the males fashioning a white frothy web which they carry in the aerial dance to attract the females.

There are some half-dozen other European species of Hilara which are known to build rudimentary webs around the small Diptera which they catch and carry for the nuptial dance, and it has been suggested that probably most species

of the genus have the ability to produce viscous bubbles while they are engaged in quieting their prey by jabs with the sharp proboscis. This propensity has been elaborated into an instinctive courtship adaptation in *Hilara sartor*.

Professor Aldrich and his student, L. A. Turley, in 1889 recorded the balloon-making habit of the males of a species of Empis, which later I described as *Empis aerobatica*. In company with Professor Aldrich on Moscow Mountain, Idaho, I have watched the behavior of this species, and again on May 10, 1925, near the junction of the Salmon and Snake rivers in Idaho, I found a considerable gathering of the flies performing their balloon-juggling act some fifteen feet above ground.

The Empididæ are typically rapacious, predatory flies, and especially at the mating season are to be found malaxating their victims with repeated thrusts of the proboscis. Poulton and Hamm have suggested an evolutionary sequence in the development of this habit, possibly somewhat as follows:

1. The prey is devoured by both sexes independently of pairing.

2. The prey, caught by the male, is given to the female upon mating, as food to divert her attention from any cannibalistic tendency while she is astride him.

3. The prey is enveloped by the male in a froth secreted by the proboscis so that it becomes more enticing to the female. The prey need not be sucked by the female but acts as an aphrodisiac.

4. A web or balloon is formed of froth alone as the indispensible stimulus to copulation.

Hilara sartor in Europe and *Hilara granditarsis* in America represent the culminating stage in this sequence, probably independently developed, while *Empis aerobatica* has advanced the third stage until the frothy balloon is vastly larger than the microdipteron that formed its nucleus and even bigger than the Empis itself.

A NEW SPECIES OF HALIPLUS

By Edith W. Mank

Lawrence, Mass.

Some beetles, collected in July 1939 in Churchill, Manitoba by Mr. Albert L. Wilk, came into the hands of Dr. H. C. Fall and were mounted just before his death. He had examined them and noted among them two possible new species, one a *Hydroporus* and the other a *Haliplus*. He mentioned to me particularly the *Haliplus*. This, I herewith wish to describe and name for him in recognition of his unfailing inspiration and help.

Both Dr. P. J. Darlington, Jr. and Mr. J. B. Wallis have most generously given their time and assistance in preparing this description.

Haliplus falli n.sp.

Holotype ♀: Length 2.79 mm. Width 1.44 mm. In general form narrower and more parallel than *longulus* to which this species runs in the key to the Haliplids by Mr. Wallis.

Head: Brownish yellow with posterior part dusky; mouth parts and antennæ the same color as the front. Surface alutaceous, making it duller than in such species as *longulus*. A punctate triangular area with base of triangle anterior, between the antennæ; also punctured areas in crescent shape around the eyes; also on posterior darkened part of the head. Smooth area, shiny not alutaceous, between the clypeus which is punctured, and the punctured area on the front. Width between the eyes half the entire width of the head. Head wider, as compared with the base of the pronotum, than in *longulus*.

Pronotum: More yellowish than the head, with basal area dark. The dark area widest between the fairly long, deep, longitudinal plicae. Also darkened medially on the anterior edge. Surface very finely alutaceous. Lateral margin nar-

row. In the holotype and in all but one of the specimens examined, this margin is continuous with the edge of the elytra. In one ♂ the base of the pronotum is slightly wider than the base of the elytra. Relatively few rather large punctures in the widest part of the dark area at the base between the plicae; disc and lateral areas with a few shallow, scattered punctures. Disc more flattened than in *longulus*. Pronotum narrowed toward the apex but less so than in *longulus*, making the apex greater in width compared with the base than in *longulus*. The apex of the pronotum is also slightly wider than the widest part of the head.

Fig. 1. *Haliplus falli* n. sp., ædeagus; Fig. 2, left paramere.

Elytra: Yellowish with black maculation consisting of a post medial sutural triangular blotch that reaches a point between the second and third striae; less definite dark markings in the form of darkened striae on the third and fourth striae posterior to the blotch; and also on the fifth and sixth striæ opposite the posterior part of the sutural blotch. Surface definitely alutaceous in the ♀. In the ♂ the surface is extremely minutely punctulate and alutaceous. Punctures forming striæ spaced well apart and on the whole about as deep as on the basal part of the pronotum. Apices of the elytra not sinuate. Body narrower than in *longulus* and more parallel, widest only a little in front of middle.

Prosternum: Prosternal process narrowest between the anterior part of the fore coxæ; sides margined; medial area not furrowed, slightly convex with relatively few large punctures; surface alutaceous.

Metasternum: Smooth at middle; margined with a very fine bead between the middle coxæ; on either side behind the middle coxæ, a group of more or less confluent large punctures, appearing at first glance to form a depression in the position of the furrows in *longulus.*

Abdomen: Ventral surface strongly alutaceous throughout.

Claws: Practically equal in length on the front tarsi.

Allotype ♂ : Post-medial sutural blotch somewhat larger than in the holotype. Also, as indicated above, surface of elytra extremely minutely punctulate and alutaceous. Front and middle tarsi with the usual pubescence on the underside of the first three tarsal segments. Claws of the anterior tarsi nearly equal, the anterior slightly shorter and more curved. Ventral surface of the abdomen alutaceous at sides except for the last segment which is alutaceous throughout.

The genitalia are as shown. The left paramere with hairs rather sparsely placed along nearly the entire length of the side. The ædeagus evenly curved, not narrowed apically as in *longulus.*

The ♀ holotype is in the Fall collection at the Museum of Comparative Zoology at Cambridge as well as one ♀ and one ♂ paratype. The ♂ allotype is in the collection of Mr. J. B. Wallis while three paratypes, two ♀ and one ♂ are in the author's collection.

Of the *Haliplidæ* with basal pronotal plicæ, this new species most closely resembles *H. longulus.* It is like *longulus* in the length of the plicæ, in the width of the side margins of the pronotum, in the fact that usually the edge of the pronotum is continuous with that of the elytra, and in the lack of a channel on the prosternal process.

It differs from *longulus,* in that the head is wider, the apex of the pronotum is wider compared with the base of the pronotum, the body is more narrow and parallel, the surface of the elytra is definitely alutaceous in the ♀ and extremely minutely punctulate and alutaceous in the ♂ and therefore not shiny, the metasternum has a fine marginal bead between the middle coxæ, and the claws of the front tarsi of the ♂ are less differentiate than in *longulus.*

All specimens examined were from Churchill, Manitoba.

NOTES ON *EPEIRA PENTAGONA* HENTZ.

By Elizabeth B. Bryant and Allan F. Archer.

Among the spiders described by Hentz from 1842 to 1850 are several that have never been recognized by later collectors. One of these is *Epeira ? pentagona.* This species, which the junior author has found rather common in the last summer in Alabama, proves to be identical with *Cyrtophora tuberculata* Keyserling [1] (1893) from Florida. The latter was wrongly placed generically and now becomes a synonym of *pentagona.* Related species recorded from the West Indies, Venezuela and Central America by Simon and O. P. Cambridge have been referred with *tuberculata* to the genus *Dolichognatha* Cambridge, the genotype of which is from Ceylon. According to Simon[2], this latter species spins a web in the form of a horizontal sheet, under which the spider stands in a manner similar to that of *Linyphia.* Since *pentagona* differs from the Ceylonese genotype in the form of web, as well as in several important structural characters, the following genus is erected for it here.

Nicholasia Gen. nov.

Cephalothorax short, cephalic portion very high; eyes, anterior row weakly recurved, eyes equidistant, a.m.e. largest of the eight, posterior row straight, p.m.e. smallest of the eight, touching and widely separated from p.l.e., lateral eyes on separate tubercles separated by a diameter of p.l.e.; mandibles two-thirds as long as cephalothorax in both sexes, no boss, narrow, slightly excavate on inner margin and the tips slightly widened, inferior margin of the fang groove with two teeth; labium much wider than long with tip truncate; abdomen short, very high at base,

[1] Die Spinnen Amerikas, **4**, Epeiridae, p. 265, pl. 14, fig. 197.

[2] Histoire Naturelle des Araignées, 1894, 1, p. 743.

globose with two pairs of widely separated tubercles; in male on anterior femora a ventral basal median row of short spines.

Genotype: *Epeira ? pentagona* Hentz.

The genus is named in honor of Nicholas Marcellus Hentz, the founder of American araneology. *Nicholasia* is separated from *Dolichognatha* O. P. Cambridge by the very broad truncate tip of the labium, fewer teeth on the inferior margin of the mandibles and by the male palpus which has a dorsal apophysis on the basal third of the cymbium and a much simpler palpus. *Dolichognatha tigrina* Simon from Venezuela and St. Vincent probably belongs to this genus since it has a dorsal apophysis on the cymbium and a very similar palpus.

Nicholasia pentagona (Hentz)

Figure 1

Epeira ? pentagona Hentz, Journ. Boston Soc. Nat. Hist., 1850, 6, p. 18, pl. 3, fig. 1; reprint, p. 120, pl. 14, fig. 1. ♀

Cyrtophora tuberculata Keyserling, Die Spinnen Amerikas, 1893, 4, Epeiridæ, p. 265, pl. 14, fig. 197. ♀.

Female. Length, 3.0 mm., ceph. 1.5 mm., abd. 2.0 mm. long, 2.1 mm. high.

Cephalothorax pale yellow, cephalic portion dark, posterior lateral margins with a narrow dark line, cephalic portion very high, strongly arched, narrow, lateral margins parallel, no thoracic groove; eyes, anterior row weakly recurved, eyes equidistant, separated by more than a radius of a.m.e., a.m.e. largest of the eight, posterior row slightly shorter than anterior, straight, p.m.e. smallest of the eight, touching, p.l.e. slightly smaller than a.l.e., lateral eyes on separate tubercles, not connected and eyes separated by a diameter of p.l.e.; clypeus less than a diameter of a.m.e.; quadrangle of median eyes wider in front and higher than wide; mandibles brown, vertical, very long and narrow, two-thirds as long as cephalothorax, no boss, tips slightly divergent, inner margin near tip excavate, with a few hairs on front surface, fang groove slightly oblique, inferior margin with two teeth; labium much wider than

long, tip truncate, rebordered; maxillæ more than twice as long as labium, slightly divergent, tips widened; sternum triangular, pale, mottled with dark gray; abdomen dark, very high at base, short and blobose with two pairs of widely separated conical angles, slightly chitinized, first pair fully two-thirds from base, venter dark with a few pale spots; legs, 1-2-4-3, anterior pairs longest, dark with pale rings at base and middle of tibiæ, posterior pairs with femora pale except for a dark ring at tip, spines slender and inconspicuous, I pair, femur, dorsal, 1 median, 3 prolateral, ventral, O, patella, 1 at tip, tibia, dorsal, 2, basal and median, prolateral, 2, retrolateral, 2, ventral, O, metatarsus, ventral, 1 prolateral at base, II pair, femur, O, patella, O, tibia, dorsal, 1 median, retrolateral, 2, ventral, O; epigynum a transverse elongate oval, fully three times as

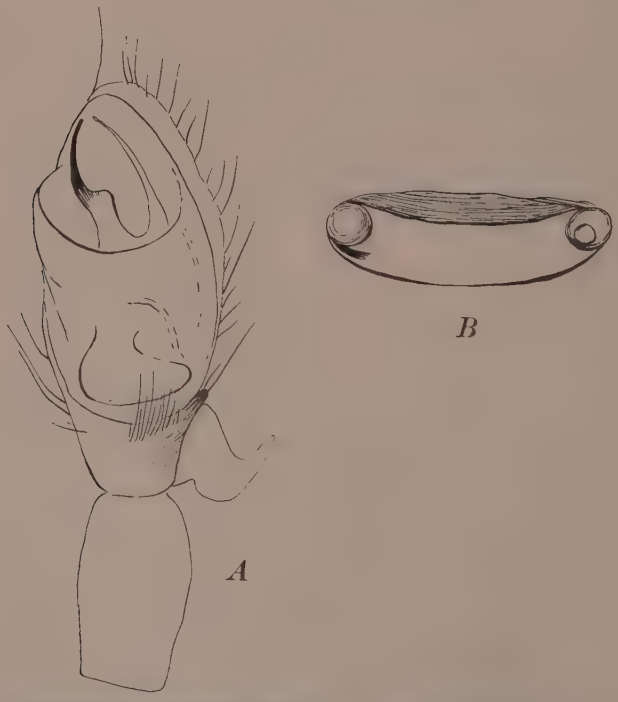

Fig. 1. *Nicholasia pentagona* (Hentz). *A*. Ventral view of left palpus (♂). *B*. Ventral view of epigynum (♀).

long as wide, margins heavily chitinized, with small dark dots in outer corners, area between convex and white.

Male. Length, 2.4 mm., ceph. 1.5 mm., abd., 1.2 mm.

Coloring same as in female, cephalic portion higher; eyes same as in female; mandibles longer and narrower, slightly excavate on inner margin and tips more divergent, front surface granular, no boss, fang groove oblique, one large blunt tooth probably on inner margin near median edge; labium, maxillæ and sternum same as in female; abdomen pale with dark gray blotches, short, globose with two pairs of widely separated conical angles more pronounced than in female and the tips plainly corneous; legs paler than in female and the pale rings wider, spines longer and more conspicuous, I coxa not modified, anterior femora with a ventral median row at base of 4 or 5 small, short, stout spines, each from a raised base; palpus pale, short and rather small, little longer than mandibles, a large dorsal lobe, semi-transparent, protruding from base of cymbium with prolateral margin rolled and ending in a hook, tibia longer than patella, cymbium dark, three times as long as wide, embolus and conductor confined to distal third, conductor black, curved and enlarged near origin, embolus colorless, straight and slender, placed between conductor and cymbium, basal third of bulb constricted.

The Hentz collection of spiders has disappeared and nothing remains but a few pins and labels.

Neoholotype ♀ Alabama; Tuscaloosa, 5 August 1939, (Archer).

Allotype ♂ Alabama; Tuscaloosa, 5 August 1939, (Archer).

The web of *Nicholasia pentagona* is difficult to observe in minute detail because of the poorly lighted locations in which it is found. It is a small web, barely 1½ inches in greatest diameter, and it is rather delicate. It is a horizontal orb-web, usually having four foundation lines and four radiating lines extending from a weakly defined hub. There are a varying number of spirals, usually less than a dozen. One foundation line connects terminally or centrally with a horizontal line outside of the web. The horizontal line extends between two walls of the shelter. From it hang two threads which become fused into a single thread,

and from the thread hangs a silk-covered cord into which is incorporated the egg sacs. The cord is covered with debris consisting of fragments of bark, stems and leaves, as well as sand, humus, and small fæces. Occasionally the corpse of a victim is included in the mass. The male makes a cord that is an amorphous mass of debris. Its web is similar to that of the female, and is often located near that of the latter.

The spider ordinarily takes its station at the lower end of the cord, and is almost completely invisible against its background. When disturbed it draws the loose end of the cord together in a U-shaped loop, but seldom abandons it unless the cord is removed from place. Only once was the spider seen under the hub of the web, probably attracted there by its prey. Its food evidently consists of small Hemiptera and Diptera.

Seasonal records show that the females are adult from June to November. The males have been found only during the period extending from late July to early October. Spiderlings seem to appear in October.

Habitats: This spider is apparently confined to forest cover. Its habitats are largely limited areas within the vicinity of streams, both permanent and intermittent, near bodies of water, and in some cases in swamps that are not subject to high water. Its ecological situations are as follows: Steep slopes of narrow valleys and ravines; very shallow ravines having a negligible slope; bluffs of large creeks; generally distributed in woods having gradual or gentle slopes. It does not prosper in areas frequently burned over. It occurs in the following types of timber cover: Mixed mesophytic hardwoods; evergreen-deciduous hardwoods; oak-hickory; oak-pine on slopes; gum swamps; hammock woods, especially the type located on the summits of low bluffs above the Mobile Delta.

Nicholasia pentagona prefers no special species of tree, providing adequate shelter is present. Its habitat stations are as follows: webs located in scars at bases of trees (gums, magnolias, at least nine species of oaks, tulip poplar, sweetgum, pines); between the roots of beech trees; in hollows along the sides and at the ends of all sorts of rotting

logs (*Passalus cornutus* stage); in undercuts of sandstone and conglomerate ledges; in undercuts of eroding stream banks. In one instance it was found on a low bank formed by transported silt collected at the base of an old wire fence in second-growth woods on a gradual slope (Andalusia, Ala.). Often associated with this spider are species of *Theridion* and sometimes *Theridiosoma radiosa* McCook.

Distribution

This spider occurs widely in Alabama having been taken near the four corner of the state. It seems to be confined to no special climatic complex or physiographic province, for it has been found in the Coastal Plain, Piedmont, and Appalachian Plateaus.

In the following records of distribution, unless otherwise indicated, specimens are females except where noted. All dates are recorded for 1939.

Baldwin Co.; Jackson Oak, Aug. 31; Bay Minette, Aug. 28. Butler Co.; Searcy, Sept. 1. Chilton Co.; Verbena, Oct. Covington Co.; Andalusia; Red Level, Aug. 27. Dallas Co.; Valley Creek State Park. Escambia Co.; Brewton, Aug. 29. Hale Co.; Moundsville. Houston Co.; Chattahooche State Park, Oct. 15. Jefferson Co.; Morris, ♂, Sept. 7; Cooley Creek, ♂, Oct. 2. Lawrence Co.; Black Warrior National Forest, June 11-15. Lee Co.; Chewacla State Park; Opelika. Madison Co.; Monte Sano, ♂, Sept. 29. Morgan Co.; Trinity Mountain. Shelby Co.; Calera. Tuscaloosa Co.; Tuscaloosa, ♂, Aug. 5; Yellow Creek. Winston Co.; Black Warrior National Forest.

ON SOME CHILOPODS FROM BARRO COLORADO ISLAND

By Ralph V. Chamberlin

University of Utah.

The humus dwelling chilopods listed in the present paper constitute a collection made by Mr. Eliot C. Williams, Jr., of Northwestern University, on Barro Colorado Id., Panama, in July and August, 1938, with the exception of *Taeniolinum panamicum*, the representative of which was taken in the Changuinola District by F. R. Swift. The types of the new forms are in the author's collection.

Cryptopidæ

Newportia rogersi Pocock

Newportia rogersi Pocock, Biol. Centr. Amer. Chilopoda, 1896, p. 33, pl. 3, figs. 6-6d.

Newportia rogersi, Chamberlin, Proc. U. S. Nat. Mus., 1922, vol. 60, art. 7, p. 5.

Twelve partly grown specimens of this species were taken at different dates in August. It was previously reported from Costa Rica at Volcan de Irazu (type locality), Cocos and San José.

Scutigeridæ

Pselliodes sp.

One young specimen was taken Aug. 9. It is possibly *P. nigrovittata* (Meinert), for which Panama is the type locality.

Schendylidæ

Schendylurus (Schendylotyn) integer Chamberlin

Schendylurus (*Schendylotyn*) *integer* Chamberlin, Proc. Biol. Soc. Wash., 1926, vol. 39, p. 10.

One specimen was taken on Sept. 3. Barro Colorado Id. is the type locality for this species, the holotype, a male, having been taken from a nest of the termite *Anoplotermes gracilis* Snyder by James Zetek, 30 Oct., 1924.

Ballophilidæ

Assuming that the inadequately known genotype of *Tæniolinum* belongs to the Ballophilidæ, as seems reasonably certain, and that it is congeneric with the form hereafter described as *T. panamicus,* the known genera of this family may be separated by means of the following key.

Key to Genera of Ballophilidæ

a. Ventral pores condensed, in one or two sharply limited and usually more or less elevated areas.
  b. Ventral pores in a single, undivided field.
    c. Antennae clavate.
      d. Prehensors lacking chitinous lines. ..... *Ballophilus* Cook
      dd. Chitinous lines present on prosternum of prehensors.
        e. Coxae of last legs with a single pore on each side; tergites bisulcate. ..... *Tanophilus* Chamberlin
        ee. Pores of last coxae two on each side; tergites not bisulcate.
          f. Field of ventral pores transversely elliptic. *Thalthybius* Attems
          ff. Field of ventral pores strictly circular. *Ityphilus* Cook
    cc. Antennae short, distally attenuated. ... *Leptynophilus,* gen. nov.
  bb. Ventral pores in two circular areas on each sternite. *Diplethmus* Cook
aa. Ventral pores diffuse, in an indistinctly limited band over caudal boarder; joints broader than long. Antennae short and thick. *Tæniolinum* Pocock

Diplethmus dux, sp. nov.

The general color of the body is olivaceous, the integument above being brown with dense green pigment showing through from beneath, the integument of sides and venter paler. Legs green.

Differs from *D. ribauti,* sp. nov., in the conspicuously broader head, in the constantly smaller number of pairs of legs (69 as against 77-79), etc. The head is more nearly of the proportions represented for the head of *D. mexicanus*

Cook, the genotype. Head conspicuously convexly bulging at the sides, with anterior margin angled at middle and posterior margin straight.

The antennæ more definitely clavate than in *mexicanus*, the distal half being considerably thicker than the filiform proximal half of the organ; distinctly geniculate.

Prehensors when closed nearly even with anterior margin of head; claws slender; prosternum with chitinous lines distinct, the anterior border deeply angularly excavated at middle.

Porigerous areas of ventral plates circular, one close to each lateral margin and caudad of middle of plate, this elevated porigerous area relatively smaller than in *ribauti*, but clearly larger than represented for *mexicanus* and very much closer to the caudal margin of plate.

Dorsal plates densely coarsely granular, not sulcate. Last dorsal plate covering pleuræ from above, elongate shield-shaped.

Last ventral plate somewhat longer than wide, narrowed caudad, a longitudinal median depression. Pores of coxo-pleuræ typical.

Last legs strongly crassate, but narrowing distally.

Pairs of legs 69 in the three type specimens.

Length of holotype, about 45 mm.

Locality.—Panama: Barro Colorado Id. Three specimens of which the holotype, a male, was taken July 13, 1938.

Diplethmus ribauti, sp. nov.

Diplethmus mexicanus Ribaut (not of Cook), Mem. Soc. Neuchatel, vol. 5, p. 90, figs. 26-37.

Diplethmus mexicanus Chamberlin (not of Cook), Occ. Papers Mus. of Zool., Univ. of Michigan, 1921, p. 17.

Prof. Ribaut, in the place above cited, has given a detailed and fully illustrated account of this species. Cook's description of *mexicanus*, embraced in a key, is confined to the following: "Ventral pores in two areas; antennæ subfiliform; Genus *Diplethmus*, type D. *mexicanus*, sp. n. (Pl. V, fig. 2), Mexico." The figures given are the only means of identification. The differences these show in size of the

porigerous area, in the shape of the head, and in the more elongate last sternite, would seem to make it impossible longer to consider the Colombian specimens as belonging to *mexicanus* since the characters mentioned are constant. Accordingly, a new name is here proposed for the Colombian species described by Ribaut.

Localities.—Colombia: Camelia, near Angelopolis; San Lorenzo. A male taken at the latter place from a bromeliad on a tree at 5,000 ft. elevation July 22, 1913, may be designated as the holotype. It is in the Museum of Comparative Zoology at Cambridge. A second male was taken at the latter locality under a log at 2,000 ft. elevation on July 25, 1913.

Taeniolinum panamicum, sp. nov.

In general characters much resembling *T. setosum* Pocock of St. Vincent; but the similarly short antennæ are slightly clavate instead of distinctly narrowing distad. The head appears to be more rounded anteriorly. The anal legs are similarly very thick proximally, narrowed distad, the last joint conical. The ventral pores are relatively sparse and are arranged across posterior border of the sternites, the poriferous area not sharply defined. Last ventral plate of moderate width, about as represented for *T. setosum,* similarly narrowing caudad. Two large coxal pores on each anal coxa, these partly covered by the last plate.

Pairs of legs, 45.

Length, 11 mm.

Locality.—Panama: Changuinola District, Boc Taso. One male taken by F. R. Swift. The only other known species of the genus is the genotype, *T. setosum* Pocock, described from St. Vincent and not since reported.

Leptynophilus, gen. nov.

Among the known genera of Ballophilidæ agreeing with *Ballophilus* and differing from all others in lacking chitinous lines on the prosternum of the prehensors. It may readily be distinguished from *Ballophilus,* as also from all the other genera excepting *Tæniolinum,* in having the antennæ attenuated instead of more or less clavately thick-

ened. Tergites not bisulcate. Ventral pores in a large transversely elliptic area. Coxal pores of last segment two on each side.

Genotype.—*L. mundus* Chamberlin, sp. nov.

Leptynophilus mundus, sp. nov.

The type as at present, after preservation in alcohol, is fulvous and shows no dark pigmentation in the deeper tissues except in connection with the ventral glands.

Head small, widest behind and narrowed forward, anteriorly rounded. Antennæ short, attenuated beyond middle; first 5 or 6 joints longest, those beyond very short, the ultimate about equal in length to the two preceding taken together; a little curved at middle but not truly geniculate.

Claws of prehensors when closed not attaining the front margin of the head by a considerable distance. Chitinous lines absent. Anterior margin of prosternum gently incurved. Claws smooth.

Body constricted a little back of head as usual. Dorsal plates not bisulcate, clothed with numerous but not dense short setæ. Last dorsal plate anteriorly broad, strongly narrowing caudad.

Spiracles round, small, very gradually decreasing in size from the first caudad.

Ventral plates conspicuously setose. The ventral pores in a sharply defined, large, transversely elliptic area behind middle of sternite.

Last ventral plate broader than long, strongly narrowed caudad. Coxal pores large, two on each side.

Anal legs much swollen as usual in related genera, the ultimate article small, conically pointed.

Pairs of legs, 51.

Length, 23mm.

Locality.—Panama: Barro Colorado Id.

Differs from *Tæniolinum setosum* in the longer, more slender antennæ, in the relatively broader and shorter last sternite, and in the larger size, the length of *T. setosum* being given as 13 mm.

PACHYMERINIDÆ

Polycricus fossor, sp. nov.

Color, pale yellow throughout.

Spiracles circular, the first much larger than the second which is intermediate in size.

Cephalic plate longer than wide, of nearly uniform width between the oblique corners; caudal margin straight. Frontal suture not evident. Antennæ short, filiform, uniformly setose, the ultimate article equalling or a little exceeding the two preceding taken together. Two very small, pale clypeal areas each bearing a single seta. Median division of labrum bearing 5 stout teeth, the lateral pieces conspicuously pectinate. Lappets of first maxillæ long and conspicuous. Coxæ of second maxillæ widely joined at middle; no coxopleural sutures evident.

Claws of prehensors when closed considerably surpassing the end of the first antennal joint. Claw at base and femur at distal end with a minute denticle, the other articles unarmed. Prosternum without chitinous lines.

Ventral pores in a band across caudal border of sternites.

Last ventral plate narrow. Coxopleural pores small and numerous as usual.

Pairs of legs, 71.

Length, about 15 mm.

Locality.—Panama: Barro, Colorado. Aug. 6, 1938. One specimen.

Differs from *P. stolli* (Pocock) in having two clypeal areas instead of one, in number of pairs of legs, etc.

CHILENOPHILIDÆ

Barrophilus, gen. nov.

A genus apparently most closely related to the African *Polygonarea.* With this genus it agrees in the structure of the second maxillæ the coxæ of which are connected only by a narrow membranous isthmus and are produced into a conspicuous conical process at the distomesal corner, the coxopleural suture running also as in that genus. Clypeal area present, single. Median dentate division of labrum

widely separating the pectinate lateral pieces. Last coxæ with peculiar setose lobes much as in *Polygonarea*. It differs from *Polygonarea* in lacking external lappets on the first maxillæ, and in lacking ventral pores on the sternites. Anal legs with terminal claw.

Genotype.—*B. isolatus*, sp. n.

Barrophilus isolatus, sp. n.

Yellow throughout, the head scarcely darker.

Cephalic plate longer than wide in the usual ratio and of the typical general shape, being widest at caudal level of frontal region from where strongly narrowing cephalad and moderately caudad to the oblique caudal corners; posterior margin straight. A true frontal suture not present. Last two articles of antennæ equalling or a little surpassing the two preceding taken together. A median clypeal area far forward at anterior end, this bearing four setæ; setæ elsewhere absent from clypeus. Labrum distinctly tripartite, the lateral pieces pectinate; the median piece dentate, about half as long as each lateral piece.

First maxillæ without external lappets; outer branch much exceeding the inner branch. Coxa of second maxillæ strongly produced at disto-mesal angle into a conspicuous conical process; coxæ separated at middle, there being a narrow, membranous and glabrous isthmus; coxopleural suture long, running ectad of each pore as in Suturodes; claw of palpus wholly smooth.

Basal plate widely overlapped by the cephalic. Claws of prehensors when closed nearly attaining the distal end of the second antennal article. Claw article at base and femuroid armed within with an acute, conical black tooth, the intermediate articles not armed. Prosternum without chitinous lines; anterior margin with median excision, unarmed.

Spiracles small, circular.

Anterior sternites with a median longitudinal sulcus; no ventral pores detected.

Last ventral plate very wide with the posterior corners strongly rounded.

Coxopleuræ of the last legs with three glands on each side opening along border of last sternite. Adjacent to

posterior end of sternite on each side and in relation to caudal gland a ventrally projecting small setose lobe which is farther forward on the joint and apparently less strongly developed than in species of *Polygonarea*.

Anal pores conspicuous.

Anal legs ending in well developed claws.

Number of pairs of legs 41 in all three types.

Length, 15 mm.

Locality.—Panama: Barro Colorado Id., July 25 and 26 and Aug. 7, 1938, one specimen on each date.

Nabocodes, gen. nov.

Clypeal area single, far forward. Lateral pieces of labrum relatively short and broad, pectinate, widely separated by the median piece. Telopodite of first maxillæ biarticulate, without external lappets. Coxæ of second maxillæ only narrowly and weakly joined at middle; the pleurosternal line long, running ectad of the mesally open pore. Prehensors long, exposed from above; claw and femoral joints armed within; no chitinous lines developed. Ventral plate absent. Last dorsal plate normally broad. Last ventral plate broad. Coxal pores small, typically few along and beneath ventral plate. Anal pores present. Anal legs without claw.

Genotype.—*Nabocodes mimellus* Chamberlin, sp. n.

This genus differs from the African *Brachygonarea* in lacking lappets on the first maxillæ and in having the anal legs clawless. It differs from *Barrophilus* in lacking the processes from meso-anterior corners of the coxæ of the second maxillæ, in lacking claws on the anal legs, and in the character of the coxal pores.

Nabocodes mimellus Chamberlin, sp. nov.

Pale yellow, with head and prehensors of slight chestnut cast.

The head of shape and proportions similar to that of the preceding species, but with anterior corners more obliquely rounded.

Claws of prehensors when closed attaining distal end of

second antennal article. Claw armed at base with an acute tooth longer than in *fossor* and the tooth of femur also larger than in the latter species.

Spiracles round, the first largest. Sternites with a longitudinal sulcus which is widest and deepest at middle.

Anal sternite broad, the sides convex; with posterior corners rounded and middle portion of caudal margin straight. Coxal pores small and few, along and beneath edge of sternite, absent laterally and above.

Anal pores distinct.

Pairs of legs, in female holotype, 49.

Length, about 17 mm.

Locality.—Panama: Barro Colorado Id.

RARE PONERINE GENERA IN PANAMA AND BRITISH GUIANA (HYM.: FORMICIDÆ)

By Neal A. Weber

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The genus *Probolomyrmex* was erected by Mayr in 1901 (*Ann. k. naturhist. Hofmus.* Wien, 16:2) for a specimen of a strange ponerine ant from South Africa which had the clypeus fused with the frontal carinæ and produced as a peculiar lobe over the mandibles. He described this as *P. filiformis*. No other specimens were known until the report by Santschi in 1914 (*Bull. Lab. Zool. Gen. Agrar.* Portici, 8:312) of a second specimen of the species from French Guinea. In 1923 Dr. Mann (*Psyche,* 30: 16-18, Fig. 2) described a third specimen, a deälate female from Bolivia, as a new species, *P. boliviensis,* which was "the first case in its subfamily of a South African and South American relationship." In 1928 Dr. Wheeler (*Psyche,* 35: 7-9, Fig. 1) described a third species (*P. dammermani*) from Java. Described below is a fourth species, *P. petiolatus,* based on a worker that I took on Barro Colorado Island, Panama Canal Zone which adds Central America to the distribution of this rare genus.

The genus *Discothyrea* is another example of a rare and odd genus of minute ponerine ants but with a more extensive distribution which has been recently summarized and the New World species have been keyed (Weber, 1939). *D. isthmica,* described below, is an additional species from Barro Colorado Island taken by Mr. E. C. Williams, Jr. Two species are now known from this remarkably rich island since I found another species (*D. humilis*) in the month preceding Mr. Williams' discovery. In no other country in the New World is more than one species known.

The genus *Sysphincta* includes a few species of sluggish and seldom seen ants found in the Mediterranean region and Japan; one species occurs in South America, two in

the United States and *S. cavernicola* Börgmeier is found in Panama. Mr. E. C. Williams, Jr., collected in Panama a worker of this species which has been known only by the female.

Alfaria so far is a strictly Neotropical genus of ponerine ants. Five species have been described from Colombia, Bolivia, Panama, Mexico and Costa Rica. Two new species are described below, one (*A. panamensis*) taken by Mr. E. C. Williams, Jr., on Barro Colorado Island and one (*A. carinata*) taken by myself in 1935 in British Guiana. The first biological notes on the genus, though very brief, were made on the Guiana species and are included below.

All specimens are in the author's collection.

Probolomyrmex petiolatus, sp. nov. (Fig. 1)

Worker. Length 1.6 mm. (thorax 0.61 mm.). Head in front view 1.4 times as long as broad, mandibles completely hidden from above, sides of head evenly convex, occipital margin feebly concave with angles evenly rounded; the

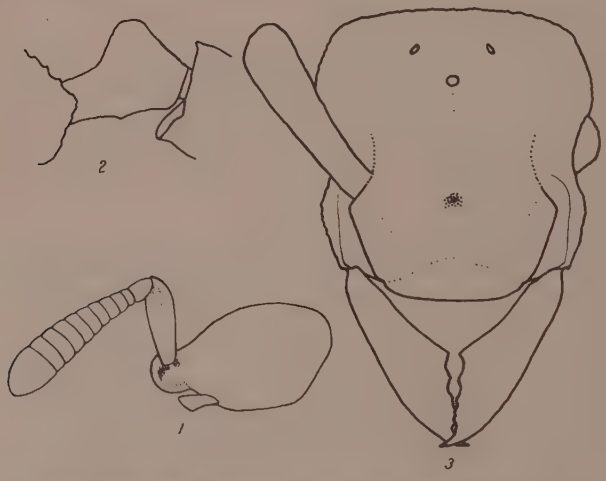

Fig. 1. *Probolomyrmex petiolatus* sp. nov., head of worker in lateral view.

Fig. 2. *Sysphincta cavernicola* Borgm., petiole of worker in lateral view.

Fig. 3. *Alfaria carinata* sp. nov., head of female in frontal view.

maximum breadth of head is slightly posterior to middle; eyeless; in side view the antennal insertions are above the mandibles; antennal scapes curved, separated at their bases by a low lamina 0.27 mm. long, joints 2-10 of the funiculus strongly transverse, terminal joint conic, nearly as long as the preceding four joints taken together; mandibles very small, strongly curved, apical tooth much the longest and acute with a series of about six irregular, acute denticles on the cutting surface. Thorax in profile with pronotum convex anteriorly, with the entire dorsum of thorax plane and without trace of sutures, posterior epinotal border forming a distinct angle with the dorsum and on the declivity produced as a distinct but rounded obtuse angle. Thorax from above broadest at pronotum, with a short collar, pronotum rounded anteriorly and sides feebly impressed in meso-epinotal region. Petiole with a short anterior peduncle, high node and much longer and sub-cylindrical posterior peduncle, from above rectangular, 1¾ times longer than broad; the node convex anteriorly and feebly excavated behind; ventral lamina in side view well-developed, the anterior margin convex, the ventral margin plane and forming with the oblique posterior margin a slight hook. Anterior margin of first gastric segment impressed at petiolar junction, feebly convex dorsally, more sharply impressed but shorter ventrally; second gastric segment much longer than the first; remaining segments largely retracted; sting long and exserted. Legs moderately long and slender.

Sub-lucid, finely, evenly and shallowly punctate, the punctations partly large, partly small.

Pubescence a very fine, whitish appressed pubescence. Color an even ferruginous of moderate density.

Holotype: One worker taken by myself June 29, 1938 on Barro Colorado Island, Panama Canal Zone. The ant was among leaves and humus on the forest floor.

This species, first to be found in Central America, is easily distinguished from the single other New World species, *P. boliviensis* Mann of Bolivia, by the convex anterior margin of the head which is also broader, the greater number of teeth on the mandibles, the much more abruptly rising node of the petiole and its less excavated posterior surface, as well as the distinct peduncle behind. Though *boliviensis*

is known only from the unique female the characters given above are probably common to both female and worker castes. The *boliviensis* female measured 2.8 mm. which may be longer than the unknown female of the Panamanian species. This species also differs from the two Old World species, *P. filiformis* Mayr of West and South Africa and *P. dammermani* Wheeler of Java, in having the petiole pedunculate behind. *P. filiformis* is much larger (3 mm.), has a much more massive node, longer antennal joints, etc. *P. dammermani* has a much more angulate epinotum and lacks a distinct petiolar node.

Discothyrea isthmica, sp. nov.

Female (*Deälate*). Length 1.2 mm. (of thorax 0.57 mm.) Head, excluding mandibles, about 1 1/6 times as long as broad back of eyes, evenly rounded behind, anterior margin produced as a convex lobe, slightly emarginate medially, which covers the mandibular bases, eyes large, convex, situated a distance of about one-half their diameters from the mandibular insertions, the three ocelli large and prominent; lamina between the antennal insertions large, rectangular with rounded angles, the anterior margin very slightly produced; antennæ 9-jointed, antennal scapes, bent, clavate, extending to a level with the posterior margin of the eyes and distinctly not reaching a level with the anterior ocellus; funicular joints 2-7 transverse, gradually increasing in length distally, terminal joint ovate, as long as all preceding joints; mandibles trigonal, strongly convex, edentate except for a long, acute apical tooth, the cutting surface concave. Pronotum produced anteriorly as a slight collar, inferior humeral angles obtuse, thorax evenly rounded at margins, epinotal angles marked as distinct, rounded tubercles. Node of petiole in side view an acute angle rounded apically, from above nearly twice as broad as long with feebly concave anterior margin and feebly convex lateral margins, petiole ventrally with a lamina projecting anteriorly between the hind coxæ and with a rounded, obtuse angle posteriorly. First gastric segment in side view with gently convex dorsum, anterior margin straight and forming an acute angle with the dorsum and an obtuse angle with the straight

ventrum; second gastric segment more massive than first; terminal segments retracted, directed forward and downward; sting fine, exserted. Legs of moderate proportions, slender.

Integument opaque, even, covered with fine punctations between which are microscopic punctulations; punctations much shallower on the sub-lucid gaster.

Pilosity of a fine, whitish appressed pubescence. Color light reddish-brown.

Holotype: one dealate female taken July 25, 1938 by Mr. E. C. Williams, Jr., on Barro Colorado Island, Panama Canal Zone (No. 139 (447)).

This species runs to couplet 2 (*D. horni*) in my recent key (Weber, 1939) to the neotropical members of the genus. It is separated from *horni* by the distinctly tuberculate epinotum and in having the node not sharply angulate above. The other 9-jointed neotropical species, *D. testacea,* is much larger. It is interesting that this species should occur on the same island of six square miles as *D. humilis* which I found in the previous month. Aside from having 9- instead of 7-jointed antennæ this species is appreciably more massive, has a differently shaped petiole and is distinctly darker.

Sysphincta cavernicola Borgmeier (Fig. 2)

Worker (*Undescribed*). Length 2.4 mm. (thorax 0.78 mm.). Head in front view (excluding mandibles) less than one-tenth longer than wide, occipital border faintly emarginate medially, sides convex, anterior clypeal margin produced as a small pair of lobes with a minute tooth between; eyes very small, seemingly of one facet, situated in front of middle; insertions of antennal scapes projecting in front of frontal carinæ to anterior margin of clypeus, frontal carinæ small and short, almost vertical, fused together into a lobe over half as thick as high; antennal scapes short, stout and curved, extending barely a third their length beyond the eye level; funicular joints 2-10 strongly transverse, terminal joint slightly longer than the preceding four taken together; mandibles trigonal with four coarse teeth of which the apical is distinctly the largest. Thorax in profile without trace of sutures, the pronotum forming an

evenly rounded right angle, the epinotum descending in an even convexity without teeth or tubercles; from above the thorax is seven-tenths longer than wide, being widest at the pronotum. Petiole distinctly pedunculate, the node in profile rounded-conic and from above transversely elliptical, being slightly wider than long, ventral surface of petiole with a feeble angular lamina medially, first gastric segment higher and broader than long, the anterior margin truncate, the sides convex, second segment longer than high, remaining gastric segments directed anteriorly. Legs of moderate proportions.

Sculpturing largely hidden by pilosity so that the ant seems dull except under intense light and moderately high magnification. Head, thorax, petiole and first gastric segment densely and deeply punctate. Pronotum, petiole and first gastric segment slightly punctate-vermiculate. Epinotal declivity on either side with a row of tiny tubercles. Second gastric segment sub-lucid, nearly smooth. Mandibles coarsely striate.

Pilosity of abundant short, fine, yellowish hairs, partly upright, mostly reclinate.

Dull brownish-red.

Allotype (Ergatotype): One worker taken by Mr. E. C. Williams, Jr., July 31, 1938 (No. 1410) on Barro Colorado Island, Panama Canal Zone. This worker agrees well with Borgmeier's recent (1937) description of a winged female from the Chilibrillo Caves in Panama except for the usual sexual differences. The female is 3 mm. long, has much larger eyes and the clypeal lamina is seemingly more projecting.

This species differs from the South American *S. micrommata,* according to Roger's original description, in smaller size, appendages being concolorous with the body, much denser pilosity, and in coarser sculpturing. It differs markedly from *S. pergandei* Emery of the United States especially in having the petiole clearly pedunculate.

Alfaria panamensis, sp. nov.

Female (*Deälate*). Length 3.2 mm. (thorax, including collar, 1.34 mm.) Head, excluding mandibles, distinctly longer

than broad, broadest back of eyes, occipital margin straight or faintly concave, occipital corners rounded, head in side view with the posterior ventral angle of occiput produced as a distinct carinate lobe on each side of a short thoracic neck; anterior clypeal margin truncate, eyes moderately large, convex; frontal lobes large and convex, feebly angulate behind, extending to anterior clypeal margin when viewed from in front, and to a level posteriorly with the anterior one-fifth of the eyes; between the lobes is a deep, roughly circular impression; antennal scrobes laterally with a low but acute carina; antennal scapes slightly surpassing occipital margin, terminal funicular joint slightly longer than the preceding three taken together; mandibles coarsely striate, with six or seven acute teeth and a long, acute apical tooth. Thorax in profile flat, with evenly convex anterior pronotal margin descending to a sharply delimited collar mostly hidden by the posterior occipital tubercles; inferior humeral angles acute but rounded apically; epinotal declivity faintly concave, interrupted above the middle by a large, protuberant spiracle on each side. Petiole in side view convex above, concave below, distinctly higher than long, from above a little longer than broad with posterior margin convex. First gastric segment from above broader than long; second segment much larger, with remaining segments directed anteriorly. Legs of moderate proportions.

Opaque, body coarsely sculptured, head reticulate—vermiculate with depressions finely punctate, thorax irregularly vermiculate with the vermiculations above tending to run longitudinally; petiole coarsely reticulate, finely punctate in impressions, gaster reticulate, the reticulations becoming feeble posteriorly; appendages finely punctate, tibiæ finely striate.

Pilosity of moderately abundant, upright yellowish hairs. Dark, reddish-brown, appendages paler.

Worker. Length 2.8 mm. (thorax, including a slight collar, 1.2 mm.). Similar to the female with the usual sexual differences. The mandibles are as completely, though less coarsely, striate, the antennal scapes surpass the occiput. The thorax is without trace of sutures dorsally and the epinotal declivity bears two protuberant spiracles much higher than in *A. simulans*. The petiole is convex above,

concave below with an anteriorly projecting ventral tubercle; from above the petiole is longer than broad while the first gastric segment is broader than long. The sting is massive and protuberant. Sculpturing similar except for a greater tendency towards longitudinal vermiculations instead of reticulations. Color a darker brown without a reddish cast except on the appendages.

Described from one deälate female and one worker, taken August 4 (No. 534) and July 29 (No. 358) 1938, respectively, on Barro Colorado Island, Panama Canal Zone by Mr. E. C. Williams, Jr.

This species appears close to *A. mus* Santschi also from Panama but comparing with Santschi's original description the following differences are marked: the groove extending back from the impression between the frontal lobes is entirely lacking in *panamensis,* the scapes surpass the occiput, the mandibles are entirely striate except on the cutting margin instead of striate only at the base, the petiole is distinctly longer than broad instead of as broad as long, the postpetiole is distinctly broader than long and the size is smaller. It is much smaller than *A. bufonis* Mann of Mexico and lacks a meso-epinotal impression. Both *simulans* Emery of Costa Rica and *emeryi* Forel of Colombia have the occiput concave and *simulans* has also a clypeus convex in profile, the mandibles more massive, the epinotal spiracles lower and less protuberant, the petiole dorso-posteriorly not produced, the eyes smaller; *simulans* is also much larger. *A. minuta* Emery of Bolivia is larger, has shorter antennal scapes, and the frontal impression is not noted in the original description.

Alfaria carinata, sp. nov. (Fig. 3)

Female (*Deälate*). Length 3.5 mm. (thorax, including a short collar, 1.4 mm.). Head, excluding mandibles, in front view broadest back of eyes, slightly longer than broad; occipital margin straight, corners slightly rounded, ventral angles produced as distinct carinate lobes on each side of the thoracic neck; anterior clypeal margin truncate; antennal scrobes in the form of a smooth, broad impression which is delimited laterally by a distinct, acute carina that curves medially in front of eyes; frontal lobes extending to the

anterior clypeal margin in front view, with sinuate lateral margin which is obtusely angulate posteriorly and extends to a level with the anterior margin of the eyes; between the lobes is a distinct circular impression somewhat divided by a continuation of a median carina; antennal scapes stout, distinctly exceeding occipital margin, terminal funicular joint longer than the three preceding joints taken together but shorter than the preceding four; mandibles finely and completely striate, with a long, acute apical tooth and a cutting edge bearing 3-7 irregular feeble denticles of which only the basal tooth is constantly developed. Thorax with a short, reflexed collar from which the pronotum rises as an even convexity to the plane thoracic dorsum when viewed laterally; inferior humeral angle in the form of an acute tooth; epinotal declivity rounded with a large spiracle on each side only feebly projecting. Petiole longer than high, with evenly convex dorsum and concave ventrum terminating anteriorly as a distinct, rounded tooth, from above squarish with feebly convex posterior margin and sides and as broad as long. First gastric segment from above appreciably broader than long, sides convex, anterior and posterior margins truncate, antero-ventrally produced as a large lobe; second gastric segment longer than the first and much more massive; remaining segments capable of being entirely retracted except for a massive sting. Legs of moderate length and slender.

Opaque, coarsely sculptured; head vermiculate with a tendency of the sculpturing to become reticulate on the occipital region and back of eyes; pronotum reticulate, thorax above longitudinally vermiculate, petiole and gaster reticulate—vermiculate, becoming feebler on the second gastric segment; legs finely punctate, tibiæ lucid, finely striate.

Pilosity of moderately abundant, upright yellowish hairs.

Color dull reddish-brown, appendages lighter and richer in color.

Described from two deälate females which I took August 20, 1935 back of the Forest Settlement, Mazaruni River, British Guiana.

This species differs from *A. simulans, bufonis* and *emeryi* in having the occipital margin straight and not concave,

from *minuta* in having longer antennal scapes, and from *mus* in having the mandibles entirely striate, the antennal scapes longer, and the first gastric segment broader. The female of *bufonis* is probably much larger. The *panamensis* female is smaller, has the mandibles more coarsely striate and more distinctly dentate, the lateral carina of the antennal scrobes less distinct, the epinotal tubercles much more protuberant, and the petiole longer than broad. *A. carinata* is named from the very distinct lateral carinæ of the antennal scrobes.

These ants were found in swamp rain forest back of the settlement. On a huge fallen log supported by its branches and buttress roots these two females, dealate females of *Myrmicocrypta spinosa* Weber and *Cyphomyrmex rimosus* Spinola, and a nest of *C. bigibbosus* ssp. *faunulus* Wheeler occurred in a small area of a few square centimeters. The *Alfaria* were under the harder shell of the log among debris left by wood-boring beetles and other insects in the softer internal wood. They moved about slowly as do dacetonine ants and were not discommoded by the strongly reflexed gaster, whose terminal segments were carried beneath the body. When I handled the ants they turned the terminal gastric segments from side to side, the large two basal segments remaining rigid, and protruded the long sting in exactly the fashion of wasps. The sting of these small ants could not penetrate the skin. One was kept for a time in a small container and by August 27 had laid a white egg which was elliptical in shape but impressed on one side so as to be somewhat kidney-shaped. On a following day the egg was eaten. Unfortunately no other biological observations have been made on these archaic ants.

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NOTES ON HIPPOBOSCIDÆ.
14. THE GENUS ECHESTYPUS SPEISER

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Echestypus Speiser

Echestypus Speiser, 1907, Wiss. Ergebn. Schwed. Zool. Exped. Kilimandjaro, II, pt. 10, p. 3; 1908, Denkschr. Med.-Naturw. Ges. Jena, XIII, pt. 1, p. 176.

Speiser described the genus as new in two different publications; but it should be dated from the first appearance in 1907, where it included only two species, *Lipoptena sepiacea* Speiser (1905) and *Echestypus parvipalpis* Speiser (1907). One of these must be the genotype and I select herewith as such the older species, *Lipoptena sepiacea*. In 1908, Speiser included *Lipoptena sepiacea* and *Echestypus binoculus* Speiser (1908); but not *E. parvipalpis*. Aldrich (1923, Insecutor Inscitiæ Menstr., XI, p. 77) selected "*E. binoculatus* Speiser" (misspelling of *binoculus*) as genotype; but, that species not being mentioned with the 1907 description, Aldrich's type designation is invalid.

Echestypus agrees with *Lipoptena* in all essential characters, save two, the absence of ocelli and the short or vestigial palpi. Neither of these characters is of particular phylogenetic importance in Hippoboscidæ, and I am inclined to regard *Echestypus* merely as a subgenus of *Lipoptena*. Within the limits of the latter genus, the length of the palpi varies considerably, being very short in some species.

The three species which I recognize in *Echestypus* agree also in the following characters, all of which, however, are found in one species or other of *Lipoptena*. Head and thorax dorsally with few, spaced setæ: one to six frontal bristles, none of them behind the eyes; one pair of vertical bristles; mesonotum on each side with a conspicuous curved

row of four to six short, dorsocentral setæ; three humeral bristles (two anterior, one posterior); two rows of notopleural setæ (before base of wing), those of the posterior row very long; two presutural bristles (one short and one long) close to the notopleurals; on each side two to five prescutellar bristles, the external ones placed close to the base of the wing, the single internal one very long, far from the others and seemingly in line with the dorsocentrals; scutellum with one or two pairs of apical setæ. Abdomen with sclerotized tergal plates as follows: a short basal plate, more or less fused with the first pleurite on each side (though generally much darker) and excised in the middle by a broad triangle, the apex of which extends as a narrow notch; hind margin of basal plate with a row of three to eight long setæ on each half, the disk either bare or with a few setæ mostly in a transverse post-median row; second to fourth tergites each with a more strongly sclerotized transverse plate near the hind margin, variable in size, the plate bearing a pair of distant setæ or a medially interrupted row of three to six setæ; most of fifth and sixth tergites strongly sclerotized, short, bearing one or two pairs of long setæ near the apex; the tergal area occupies about the median half of the dorsal surface, the remainder being covered by four partly sclerotized pleurites, which are even more developed ventrally than dorsally and bear scattered setæ (more numerous ventrally). Ventrally the abdomen has a strongly sclerotized basal crescent-shaped sternite, the disk partly covered with short, thick, almost spine-like setæ (two of these much longer in each apical corner); remainder of median ventral area not sclerotized, but soft and fairly uniformly covered with scattered short setæ. Setæ of sternum short, spine-like, few in number and placed more or less in transverse rows. Claws of all tarsi robust and slightly asymmetrical; apical spur of fore and mid tibia stout; fore coxa dorsally without retrograde spur, but with a long seta. As in *Lipoptena*, the wings break off apicad of the base, shortly after the adult hatches. I have seen the complete wing of *E. sepiaceus* (Fig. 2) and *E. paradoxus*. It is shaped as in *Lipoptena cervi* and has the same type of venation: only three well-developed longitudinal veins, apparently the first (R_1), third (R_{4+5}) and fifth (M_3+C_1); the sixth (2d An)

is incomplete; other veins are indicated by depressed (concave) lines; only one cross-vein, between the supposed third and fifth longitudinals, therefore probably a fusion of anterior basal cross-vein (M_3), anterior cross-vein (r-m) and portion of fourth longitudinal (M_{1+2}); the third longitudinal ends in the tip of the costa at an acute angle and without knob-like swelling; the costa is thickened only at the extreme base and between the tips of the first and third longitudinals. The alula is rudimentary; the halter well developed and shaped as in *Lipoptena*. The membrane bears uniformly scattered, exceedingly minute microtrichia.

It may be noted that the external morphology is extremely similar to that of the European *Lipoptena cervi* (Linnaeus) and the Cingalese *L. efovea* (Speiser), particularly in the arrangement of the sclerites of the abdomen and in the venation of the wing.

Echestypus is known at present only from the Ethiopian portion of the African continent (south of the Tropic of Cancer), where it occurs on various antelopes, *viz.*, on bushbuck and nyala (*Tragelaphus*), reedbuck (*Redunca*), oribi (*Ourebia*), waterbuck (*Kobus*), duiker (*Cephalophus* and *Sylvicapra*), steinbok (*Raphicerus*), springbok (*Antidorcas*) and kudu (*Strepsiceros*). The host relationships are more fully discussed under each species.[1]

To some extent *Echestypus* is the Ethiopian representative of *Lipoptena*, although I have seen a true species of *Lipoptena* (with well-developed ocelli) off bushbuck and duiker in Uganda and the eastern Belgian Congo.

Four "species" of *Echestypus* have been described; but, after studying some 600 specimens, from 90 different lots and off more than a dozen hosts, collected throughout tropical and South Africa, I am able to recognize three species only. These are, moreover, very similar, as will be seen from the subjoined key. As I was unable to examine the types of the four described forms and as the original descriptions are scattered and inaccessible to the average entomologist, I have reproduced them in full.

[1] Throughout this paper the nomenclature of the hosts is that of Glover M. Allen's recent "Checklist of African Mammals" (1939, Bull. Mus. Comp. Zoöl., LXXXIII).

KEY TO SPECIES

1. Palpi vestigial, not or barely visible from above beyond the anterior margin of the fronto-clypeus. Mediovertex nearly as long as or slightly longer than wide; inner orbits narrower than the eye; postvertex as long as or slightly shorter than mediovertex. Scutellum with two pairs of apical bristles. ..... *E. paradoxus.*

   Palpi short, but distinctly protruding beyond the anterior margin of the fronto-clypeus on the head seen from above, nearly half as long as the fronto-clypeus. ..... 2.

2. Mediovertex as wide as long or slightly wider; inner orbits narrower than the eye; postvertex nearly as long as or slightly shorter than mediovertex. Scutellum with two pairs of apical bristles. *E. sepiaceus.*

   Mediovertex longer than wide; inner orbits as broad as or broader than the eye; postvertex about half the length of mediovertex. Scutellum with one pair of apical bristles. ..... *E. binoculus.*

1. **Echestypus paradoxus** (Newstead). Fig. 1.

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Echestypus paradoxus D. Bruce, Hamerton, Mackie and Lady Bruce, 1911, Rept. Sleeping Sickn. Comm. Roy. Soc., XI, p. 228. C. W. Howard, 1912, Bull. Ent. Res., III, p. 218. S. A. Neave, 1912, Bull. Ent. Res., III, pp. 311, 314, 315, 320 and 322. Mason, 1916, Ann. Rept. Dept. Agric. Nyasaland for 1915-16, p. 19. Anderson, 1924, Kenya Med. Jl., Suppl. No. 1, p. 9, and Suppl. No. 2, p. 4. Bedford, 1927, 11th and 12th Repts. Dir. Vet. Res. South Africa, I, pp. 300 and 782. Ferris, 1930, Parasitology, XXII, pt. 3, p. 278, figs. 3 and 4 A-C (♀ ♂). Bedford, 1932, 18th Rept. Dir. Vet. Serv. An. Ind. South Africa, p. 421. Cuthbertson, 1937, Proc. Trans. Rhodesia Scientif. Assoc., XXXV, pt. 1, p. 33.

Eschestypus paradoxus Curson, 1928, South Afric. Jl. Nat. Hist., VI, pt. 3, p. 182.

Echestypus parvipalpis Speiser, 1907, Wiss. Ergebn. Schwed. Zool. Exped. Kilimandjaro, II, pt. 10, pp. 3 and 5 (♀ ♂; Mt. Kilimanjaro, Tanganyika Territory; off *Tragelaphus scriptus roualeyni*). Austen, 1909, Illustr. African Blood-Suck. Flies, p. 202. S. A. Neave, 1912, Bull. Ent. Res., III, p. 317. Morstatt, 1913, Der Pflanzer, IX, p. 509. Bezzi,

1916, Natura, Riv. Sc. Nat., VII, p. 178. Falcoz, 1930, Encyclop. Entom., B, Diptera, V (1929), p. 52 (♀ ♂).

Previous Records. — Belgian Congo: Kasongo, types, off *Tragelaphus scriptus;* Newstead described the species from an "antelope", but stated that "the same host also harboured a number of ticks. (*q. v.*)." These ticks, from Kasongo, are listed in his paper (p. 100) as *Rhipicephalus nitens* from *Tragelaphus scriptus.* — Uganda: Singo, off *Tragelaphus scriptus* (Bruce *et al.*, 1911). — Kenya Colony: Makindu, off *Strepsiceros imberbis* (Neave, 1911). — Tanganyika Territory: Mt. Kilimanjaro, types of *E. parvipalpis,* off "*Tragelaphus roualeyni*"; this name is now used for the South African race of *T. scriptus*; the type host of *E. parvipalpis* was probably the East African race *T. scriptus massaicus* Neumann (Syn.: *T. sylvaticus meruensis* Lönnberg) (Speiser, 1907). — Northern Rhodesia: Msoro's, 50 miles W. of Ft. Jameson, off *Tragelaphus scriptus* (Neave, 1912); 35 miles E. of Ft. Jameson, off *Strepsiceros strepsiceros* (Neave, 1912). — Southern Rhodesia: Gatooma, Hartley District, off *Sylvicapra grimmia;* Inyati, Matabeleland, off *Sylvicapra grimmia* (both Cuthbertson, 1937). — Nyasaland: Near Kota-Kota, off *Tragelaphus scriptus* (Neave, 1912); off bushbuck [=*Tragelaphus scriptus*] and warthog, without more definite locality (Mason, 1916); the warthog appears very questionable as a host. — Bechuanaland Protectorate: Sekukuniland, off *Tragelaphus scriptus sylvaticus* (Bedford, 1927 and 1932). — Transvaal: Pietersburg District, off *Strepsiceros strepsiceros* (Bedford, 1927 and 1932). — Zululand: Ubombo Flats, off *Tragelaphus angasii;* Ntambanana, off *Tragelaphus scriptus sylvaticus* (erroneously recorded in 1927 as off *Redunca fulvorufula*); Emakosini, off *Redunca arundinum*; Umfolosi, off *Sylvicapra grimmia*; without more definite locality, off *Strepsiceros strepsiceros* (all from Bedford, 1927 and 1932). — Portuguese East Africa: Pongwe Valley; tendos [?dembos] of Urema, Gorongoza Province; forest of Inhaconde, 350 m., Gorongoza Province (all without host, from Falcoz, 1930); C. W. Howard's (1912) record off an owl is open to question and probably due to an error in labelling.[1]

[1] Two specimens, collected in Portuguese East Africa by C. W. Howard, are at the U. S. National Museum, labelled "from *Sylvicapra grimmia.*"

Fig. 1. *Echestypus paradoxus* (Newstead). Female, Elisabethville, Belgian Congo. Dorsal (right) and ventral (left) view.

Specimens Examined. — Belgian Congo: Luofu, Kivu District, off *Tragelaphus scriptus* (J. P. Chapin); Rutshuru, Kivu District, off *Tragelaphus scriptus* (J. Bequaert); Katofio, Katanga, off *Sylvicapra grimmia* (B. Bennett); Elisabethville, Katanga, off *Sylvicapra grimmia* (J. De Riemaecker; L. Van den Berghe); Kasepa River near Elisabethville, off *Sylvicapra grimmia* (J. De Riemaecker); Malenda River (a tributary of the Bushibila River), near Elisabethville, off *Sylvicapra grimmia* (J. De Riemaecker); Kilwa, on Lake Moero, off *Sylvicapra grimmia* (L. Van den Berghe); Kapiri, Katanga, without host (Congo Mus.); Kibombo, Manyema, off *Tragelaphus scriptus* (J. Bequaert); Doruma, Uele, off an antelope (C. Henrard); Nyanza, Urundi (H. C. Raven). — Uganda: Entebbe, off *Tragelaphus scriptus* (R. W. M. Mettan); Stogem, off *Tragelaphus scriptus* (C. R. S. Pitman); West Nile, off *Tragelaphus scriptus* (C. R. Pitman); without more definite locality, off *Tragelaphus scriptus* (J. O. Shircore); Toro, without host (Congo Mus.); Matuba Island, Lake Victoria (G. H. E. Hopkins).—Ethiopia: Addis Abeba, off *Tragelaphus scriptus*.—Kenya Colony: Zuwani, without host (L. Bayer); Guaso Nyiro, off *Strepsiceros imberbis* (W. L. Smith).—Tanganyika Territory: Kilossa, off *Tragelaphus scriptus* and *Sylvicapra grimmia* (A. Loveridge; these specimens were erroneously recorded as *Hippobosca capensis* in Proc. Zool. Soc. London for 1923, p. 734).—Angola: 80 miles from the coast, off *Strepsiceros strepsiceros* (Brit. Mus.).—Southern Rhodesia: Matetsi, Wankie District, off *Strepsiceros strepsiceros* (R. H. R. Stevenson). — Nyasaland: Maperera Stream, Lower Shire River, off *Tragelaphus scriptus* (P. le Touzel Chapman); Henga River, and Kayuni, N. Nyasa, off "gawpi" (T. B. Davey); Karonga, without host (W. Hood-Dye); Tangazi River, Namulambo, Ruo District, off *Taurotragus oryx pattersonianus* and *Strepsiceros strepsiceros* (Rodney C. Wood); Chikonje, Ruo District, off *Strepsiceros strepsiceros* and *Tragelaphus scriptus* (Rodney C. Wood); Ruo District, off *Aepyceros melampus, Sylvicapra grimmia,* and *Tragelaphus angasii* (Rodney C. Wood). — Transvaal: without more definite locality, off *Tragelaphus scriptus*; Guernsey, District Pilgrim's Rest, off *Strepsiceros strepsiceros* (R. du Toit). — Zululand: Ubombo Flats, off *Tragel-*

aphus scriptus sylvaticus (H. H. Curson) and off *Tragelaphus angasii*; Umfolosi, off *Sylvicapra grimmia*; White Umfolosi River, off *Tragelaphus scriptus sylvaticus* and *Kobus ellipsiprymnus* (H. H. Curson); Lower Umfolosi River, off *Tragelaphus angasii*, and *T. scriptus sylvaticus* (H. H. Curson); Umkuzi River, off *Tragelaphus scriptus sylvaticus* (H. H. Curson). — Cape Province: Port Elizabeth, without host (Brit. Mus.); if the locality label is to be trusted, this specimen was possibly taken from some animal in captivity.

Host Relationships. — There are now reliable records of *E. paradoxus* from nine distinct antelope hosts. The bushbuck, *Tragelaphus scriptus* (Pallas), is by far the most common host. It is found over practically the whole of Africa south of the Sahara, in several races. G. M. Allen (1939) recognizes 27 valid races and lists many more synonyms. The nyala, *Tragelaphus angasii* Gray, is restricted to southeastern Africa. The kudus are closely related to the foregoing, from which some authors do not separate them generically. The lesser kudu, *Strepsiceros imberbis* Blyth, is restricted to Northeast Africa. The greater kudu, *Strepsiceros strepsiceros* (Pallas), occurs throughout the savanna areas of Africa south of the Sahara. Both are frequent hosts of *E. paradoxus*. The duiker, *Sylvicapra grimmia* (Linnaeus), also a common host, has about the same distribution as the greater kudu. The following four hosts are perhaps more accidental: the reedbuck, *Redunca arundinum* (Boddaert); the eland, *Taurotragus oryx pattersonianus* Lydekker; the impalla, *Aepyceros melampus* (Lichtenstein); and the waterbuck, *Kobus ellipsiprymnus* (Ogilby). These antelopes are found in the savannas of South, Central and East Africa. The two anomalous records of warthog and owl seem wholly unreliable.

Distribution. — *E. paradoxus* is reliably known in the wild state from Ethiopia, Uganda, the eastern and southeastern Belgian Congo, Kenya Colony, Tanganyika Territory, Nyasaland, Northern Rhodesia, Southern Rhodesia, Angola, Bechuanaland, Transvaal, Portuguese East Africa and Zululand. It is definitely an insect of the savanna and plains country of East, Central and South Africa, avoiding

the Rain Forest of the Congo Basin, as well as West Africa proper.

Synonymy. — The types of *E. paradoxus* are at the Liverpool School of Tropical Medicine. Although I have not seen them, there can be no doubt that the species here called *paradoxus* is the one described and figured by Newstead and later figured by Ferris (1930) under the same name.

Speiser evidently could not have been acquainted with Newstead's *paradoxus*, when he erected his genus *Echestypus*. There seems to be no reason why the three species he knew should not be the same as those recognized in the present paper. Both his *E. sepiaceus* and *E. binoculus* may, I believe, be recognized with certainty from the descriptions, as shown in the sequel. Hence, *a priori*, Speiser's third species, *E. parvipalpis*, may be Newstead's *paradoxus*, particularly in view of the fact that this is the most common and most widely distributed of the three. The types of *E. parvipalpis* are at the Stockholm Museum and I have not seen them. The statement about the unusually short palpi clearly applies only to *E. paradoxus* and the remainder of the description also fits this species better than either of the others.

The descriptions of *E. paradoxus* and *E. parvipalpis* were published the same year, but that of *paradoxus* certainly appeared first. The issue of the Ann. Trop. Med. Paras., containing the description, was dated February 1st. The paper on the Diptera Pupipara of the Kilimanjaro Expedition, by Speiser, was first recorded at the meeting of April 10, 1907, of the Stockholm Academy of Sciences (Kungl. Svenska Vetenskapsakad. Årsbok for 1908, p. 33).

Characters. — In addition to the features mentioned in the key, *E. paradoxus* is characterized by the slightly more developed chetotaxy; there is usually one more dorsocentral and the disk of the basal tergal plate bears a number of setæ, mostly in one oblique row. The second to fourth tergal sclerotized plates of the abdomen are rather smaller in the female than in the other species, although their anterior limits are poorly defined; moreover, in the male there are only four sclerotized tergal plates (II to V) behind the basal plate (I). The hind margin of the crescent-shaped basal sternite of the abdomen forms a shallow, semi-elliptical

curve. The wing, which I have seen in a male from Ruo, Nyasaland, does not differ from that of *E. sepiaceus*.

Original description of *E. paradoxus*: "Female. — Specimens preserved in Canada balsam and alcohol are red-brown inclining to orange-brown at the sides of the abdomen; claws black; base of abdomen with a bilateral patch of darker chitin, the median area of the remaining segments also with darker markings, but these are both irregular and inconstant in the preserved examples. Head as wide as the anterior part of the thorax; ocelli absent. Mouth parts rudimentary. Outer margin of eyes with a double series of spinose hairs. Thorax narrower in front than behind, with a submedian series of about nine long spinose hairs forming a curved line, and a short submarginal series of usually four similar ones terminating opposite the insertion of the mid legs; posterior margins with four long spinose hairs on either side of the scutellum; the last-named organ is also furnished with four similar hairs. Abdomen short ovate, almost sub-circular, with numerous spinose hairs arranged as shown in the figure. Venter with numerous short spinose hairs; median convex area with numerous minute equidistant tubercles bearing slender spinose hairs, the spaces between the tubercles finely but strongly rugose. Legs short, stout, sparsely clothed with hairs of varying lengths and varying degrees of thickness; the posterior pair not extending beyond the tip of the abdomen; tibial spine to anterior and mid legs stout; tibial spine to posterior legs long, slender; pulvillus broadly dilated from the middle outwards, finely spinose; feather-bristle strongly spinose; the upper surface with only one series of spines, the inner with two or three; ungues very faintly and irregularly toothed on the inner margin. Length 4 mm.; width of abdomen 2 mm. The absence of ocelli in the female is rather remarkable. There is also an almost entire absence of external mouth parts, including the labial sheath; the only indication of these organs being a minute truncated cone, the exact nature of which could not be determined in the limited supply of material."

Original description of *E. parvipalpis*: "Länge 4-5 mm., Mundrand-Scutellum 1.6 mm. Farbe braun in verschiedener Schattierung, am Hinterleib die weichhäutigen Teile weisslich gelb. — Kopf breiter als lang, der Clypeus etwas länger

als das vordere Drittel, die matte Stirnstrieme länger als breit, die Augen gross, auf den Orbiten je 2 Borsten, eine stärkere nahe dem oberen Ende, neben dem Scheiteldreieck, eine kürzere in der Mitte etwas nach auswärts von der grössten Konvexität der Orbita. Fühler ohne Besonderheiten, die aus den zusammenliegenden Maxillartastern gebildete Rüsselscheide ganz auffallend kurz, nur mit den kurzen Börstchen, mit denen sie besetzt ist, über den Vorderrand des Clypeus hinausragend, kaum länger als an der Basis breit. Thorax in der allgemeinen Konfiguration wie bei *Lipoptena* und *Echestypus* sonst. Die mit 3 kräftigen Borsten besetzte Schulterschwiele ist nicht durch eine so deutliche Naht abgegrenzt wie bei *Echestypus* spec. typic., jederseits der Längsnaht stehen 5 Borsten in etwa hyperbolisch gekrümmter Reihe, auf den kurzen Scutum mesonoti jederseits 4, auf den Pleuren vor der Flügelwurzel 2 Reihen von je 4 Borsten, die vorderen kürzer, die hinteren länger. Scutellum mit 4 Borsten, zu denen bisweilen noch eine überzählige fünfte an einer Seite der Vierergruppe kommt. Flügelstumpfe mit kaum mehr erkennbaren Rest von Geäder, Halteren weisslich gelb, gross und voll entwickelt. Abdomen in der allgemeinen Konfiguration mit *Echestypus* spec. typ. übereinstimmend. Das erste Tergit als ein Paar dunkelbrauner Platten auf den weicheren zweiten liegend, jederseits nahe dem Hinterrande mit 4 dünnen kurzen Börstchen. Die Hinterrand des zweiten in der Mitte tief und spitz eingebuchtet, in dieser Bucht jederseits 5 lange ziemlich kräftige Borsten, die Seiten weitläufig mit kürzeren bedeckt. Dahinter liegen 4 derber chitinige Tergite, denen 3 weichere, deutlich abgegrenzte Pleurite entsprechen. Die Tergite sind noch eigentümlich konfiguriert: III ist fast ganz, mit Ausnahme einer ganz weisslich häutigen Partie, die den spitzen Winkel im II Tergit ausfüllt, derb chitinig, quergerunzelt und dunkelbraun, am Hinterrande in der Mitte liegt aber eine etwa halbelliptische heller braune Platte, an deren Hinterrande wieder jederseits 2 schwache Börstchen stehen. Sonst stehen Börstchen nur noch an den Seiten des Tergits, jederseits 3 am Hinterrande und 2 etwa auf der halben Länge davor. Die beiden folgenden sind ähnlich, die dunkle Chitinisierung ist aber mehr auf die Seiten beschränkt, das helle besonders herausgehobene Feld

ist bei IV schon etwas, bei V noch wieder breiter, trägt bei IV jederseits 2, bei V jederseits 1 Börstchen, auf den Seiten bei IV nur noch 3, bei V keine Börstchen mehr. Tergit VI, dem kein eigentliches Pleurit mehr entspricht, ist eine quere Platte, die nahe ihren Hinterecken jederseits 3 Borsten trägt, und auf ihrer Fläche zwei dunkler chitinige Seitenflecken erkennen lässt. Das nun folgende Analsegment, durch den Besitz von 2 Stigmenpaaren als VII + VIII gekennzeichnet, ist nackt mit Ausnahme eines Kranzes von Borsten um die Analöffnung. Die dem III Tergit entsprechende Pleuritplatte ist gleichmässig weitläufig kurz beborstet, die dem IV Tergit entsprechende nur in der vorderen Hälfte, die dem V entsprechende nackt mit Ausnahme von 2 Borsten am Rande. Diese Angaben über die Pleuritplatten beziehen sich auf die Ansicht a tergo; auf der Bauchseite sind sie alle ebenso wie die nicht segmentarisch abgeteilte Ventralfläche gleichmässig kurz beborstet. Das dunkelbraune Basalsternit kann man etwa als ein gleichseitiges Dreieck beschreiben, dessen hintere Ecken als halbrunde (sie sind in sich etwas gewölbt) Zapfen soweit nach hinten vorgezogen sind, dass am Hinterrande ein halbkreisförmiger Ausschnitt entsteht. Der Hinterrand ist ganz mit dornartig kurzen Borsten besetzt, ebenso die Zapfen selber und ihr Seitenrand, während die Basishälfte nur wenige schwache Borsten aufweist. — Diese bisher beschriebenen Verhältnisse sind bei ♂ und ♀ ganz gleich, Abweichungen ergibt nur die Genitalregion. Hier wird beim ♂ die Genitalöffnung von zwei sanften, mit den gewöhnlichen Börstchen der Ventralfläche besetzten Höckerchen flankiert während beim ♀ vor der Genitalöffnung eine breite fingernagelförmige, etwas derber chitinige Platte liegt, die sehr dicht mit ziemlich feinen Börstchen, in etwa 3-4 Reihen vor ihrem Hinterrande besetzt ist. Vor dieser Platte liegt noch eine kleinere, die offenbar dem Hinterrande eines (VI?) Sternites entspricht, dunkel gelbbraun und mit 3-4 Borsten besetzt, vor dieser eine unregelmässig verdoppelte Reihe Borsten, die keiner Segmentgrenze entsprechen. Die Beine sind kräftig, die Hüften stark beborstet, die Vorder- und Mittelschenkel etwas verdickt, auf den Hinterschenkeln steht auf der Vorderseite am Anfang des letzten Drittels eine kräftige auffallende Borste. Die Tibien sämtlich auf der Oberseite (dor-

sal) fast kahl und nur ventral mit kräftigen Borsten besetzt." ♂ ♀.

2. **Echestypus sepiaceus** (Speiser). Figs. 2 and 3.

Lipoptena sepiacea Speiser, 1905, Zeitschr. Syst. Hym. Dipt., V, p. 353 (♀; Caffraria; and Witu, Lamu and Wangi, Kenya Colony; no host). Bezzi, 1908, Bull. Soc. Ent. Italiana, XXXIX, (1907), p. 198.

Echestypus sepiaceus Speiser, 1907, Wiss. Ergebn. Schwed. Zool. Exped. Kilimandjaro, II, pt. 10, p. 3; 1908, Denkschr. Med.-Naturw. Ges. Jena, XIII, pt. 1, pp. 176 and 178. Austen, 1909, Illustr. African Blood-Suck. Flies, pp. 187 and 196. H. H. King, 1911, 4th Rept. Wellcome Res. Lab. Khartoum, vol. B, p. 126, Pl. VI, fig. 5 (♀). S. A. Neave, 1912, Bull. Ent. Res., III, p. 320. Bezzi, 1916, Natura, Riv. Sc. Nat., VII, p. 178. W. B. Johnson, 1918, Nigeria, Ann. Med. Sanit. Rept. N. T. Prov. for 1917, p. 165. Davey and Newstead, 1921, Ann. Trop. Med. Paras., XV, p. 461. Anderson, 1924, Kenya Med. Jl., Suppl. No. 1, p. 9. Bedford, 1927, 11th and 12th Repts. Dir. Vet. Res. South Africa, I, p. 782; 1932, 18th Rept. Dir. Vet. Serv. An. Ind. South Africa, p. 421.

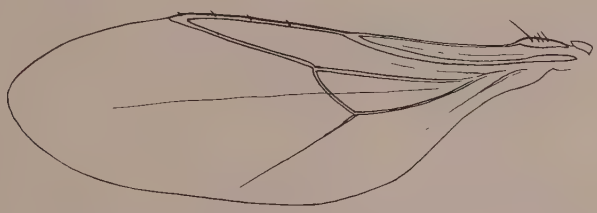

Fig. 2. Wing of *Echestypus sepiaceus* (Speiser), female, Bulukatoni, Uganda.

Eschetypus sp. J. J. Simpson, 1914, Bull. Ent. Res., V, pp. 24, 25, 30 and 35.

Previous Records. — Gold Coast: Sawla, off duiker (*Cephalophus* sp.); Banda N'Kwanta, off "red-flanked duiker", *Cephalophus rufilatus*; Bandowa, off "oribi", *Ourebia ourebi*; all three localities in the savanna country north of the Volta River (Simpson, 1914; as *Eschestypus* sp.; I have seen these specimens). — Anglo-Egyptian Sudan: Kio, without host

(King, 1911). — Kenya Colony: Witu, Lamu and Wangi, without host, cotype.—Nyasaland: Upper Shire River, south of Lake Malombe, off *Strepsiceros strepsiceros* (Davey and Newstead, 1921). — Cape Province: Caffraria, without host, cotype.

Specimens Examined. — Gold Coast: Sawla, off *Cephalophus* sp.; Banda N'Kwanta, off *Cephalophus rufilatus*; Bandewa, off *Ourebia ourebi quadriscopa*; Guripe, off *Cephalophus* sp. (all J. J. Simpson). — Anglo-Egyptian Sudan: Darraba, Dinder River, off *Ourebia ourebi montana* (G. M. Allen); Bongo, River Nile, Equatoria, off Abyssinian blue duiker, a race of *Cephalophus caerulus* (Neal Weber). — Uganda: Bulukatoni, West Nile, off *Tragelaphus scriptus* (C. R. S. Pitman).

Host Relationships. — *E. sepiaceus* has been definitely recorded from five distinct antelope hosts. The red-flanked duiker, *Cephalophus rufilatus* Gray, is strictly West African (Upper Guinea to northeastern Belgian Congo). The blue duiker, *Cephalophus caerulus* (Ham. Smith), occurs in several races in South and East Africa, as far north as the eastern Sudan. The distribution of the bushbuck, *Tragelaphus scriptus* (Pallas) and of the greater kudu, *Strepsiceros strepsiceros*, are discussed under *E. paradoxus*, as these antelopes harbor both species of *Echestypus*. The ouribi, *Ourebia ourebi* (Zimmermann), occurs in several races in the savannas of most of Africa south of the Sahara.

Distribution. — *E. sepiaceus* is now known with certainty from the Gold Coast, the Anglo-Egyptian Sudan, Uganda, Kenya Colony and Nyasaland. The only record for South Africa proper is based on the old specimen from "Caffraria", which Speiser included among the types. Perhaps it might be well to examine this fly more carefully, to see whether it is strictly cospecific with the cotype from Kenya Colony.[1] Like *E. paradoxus*, *E. sepiaceus* is evidently an insect of the savanna and plains country of Central and East Africa, but it extends much farther west, across the Sudan. It should be looked for in French Guinea and Senegambia.

Synonymy. — *E. sepiaceus* was originally based upon two

[1] In case the Caffraria specimen was of a different species, I herewith restrict the name *sepiaceus* to the form represented by the type from Witu, Lamu and Wangi.

Fig. 3. *Echestypus sepiaceus* (Speiser). Female, Bulukatoni, Uganda. Dorsal (right) and ventral (left) view.

females at the Berlin Museum, one dry, labelled "Caffraria, Drège"; the other in alcohol, labelled "Witu, Lamu u. Wangi 23/8, 95, Denhardt." I have not seen the types. That Speiser's and my *sepiaceus* are the same is shown by the following statements in the original description: "Stirnstrieme etwas breiter als lang. . . . Maxillarpalpen kurz." It is further confirmed by the comparison drawn by Speiser (1907), in a key, between *E. sepiaceus* and his *E. parvipalpis* (= *paradoxus* Newstead).

Characters. — In addition to those given in the key, the chetotaxy is somewhat less developed than in *E. paradoxus*, there being usually one dorsocentral less, while there is no transverse row of setae on the disk of the basal tergal plate. The second to fourth tergal sclerotized plates of the female are larger than in *E. paradoxus*. The hind margin of the crescent-shaped basal sternite of the abdomen forms a deep semi-circular curve. The claspers (or parameres) of the male genitalia are stronger than in *E. paradoxus*.

Original description of *E. sepiaceus*: "♀. Länge 3.8-4.2 mm.; Mundrand-Scutellum 2.2 mm. Russbraun mit etwas helleren Vorderbeinen und Schenkelwurzeln und graubraunem Abdomen. Kopf rundlich mit grossen Augen, die wenig schmäler als hoch sind. Stirnstrieme etwas breiter als lang, Lunula ohne Grübchen, heller lederbraun abgesetzt. Clypeus am Vorderrande ebenfalls heller braun, mit einer feinen Mittellinie. Maxillarpalpen kurz. Thorax auf seinem vorderen Abschnitte etwas heller braun als hinten. Skulptur und Beborstung wie gewöhnlich. Metasternum halb so lang als Mesosternum. Beine mehr oder weniger hell kastanienbraun mit dunkeln Knien und Tarsengliedern. Abdomen ähnlich dem von *L. cervi* L. Das erste Tergit wie gewöhnlich nur in der Form zweier derberer Platten zu beiden Seiten der Hinterleibswurzel auf dem zweiten darauf liegend. Dieses ist weniger derb als bei *L. cervi* L., mit geschwungenem Hinterrande, in der Mitte eingezogen. Das dritte Tergit ist länger als bei *L. cervi* L. Es ist an seinem Vorderrande, der sich an den Ausschnitt des Basalsegments 1 und 2 anlegt, nur schwach, am Hinterrande in einem rechteckigen queren Stück derb chitinisiert und dieses Rechteck entspricht den ebenso gestalteten, dahinter liegenden 3 folgenden Tergiten. Das Basalsternit ist an seinem

Hinterrande so tief ausgebuchtet, dass es nur aus zwei zungenförmigen, vorne in ihrer eigenen Breite zusammenhängenden, divergierenden Lappen besteht. Sonst ist die Ventralfläche gleichmässig beborstet und nur vor der Genitalöffnung ein wenig derber bräunlich chitinisiert."

3. **Echestypus binoculus** Speiser. Fig. 4.

Echestypus binoculus Speiser, 1908, Denkschr. Med.-Naturw. Ges. Jena, XIII, pt. 1, p. 176, fig. (♀ ♂; Kalahari; off *Raphicerus campestris*). Bezzi, 1916, Natura, Riv. Sc. Nat., VII, p. 178. Bedford, 1932, 18th Rept. Div. Vet. Serv. An. Ind. South Africa, p. 420.

Echestypus binoculatus "Speiser" Aldrich, 1923, Insecutor Inscit. Menstr., XI, p. 77 (error for *binoculus*).

Previous Records. — Kalahari: Without more definite locality, off *Raphicerus campestris*, types. — Cape Province: Middelburg, off *Antidorcas marsupialis* (Bedford, 1932).

Specimen Examined. — Orange Free State: Hoopstad District, one female, off *Raphicerus campestris* (R. du Toit).

Host Relationships. — The few specimens known were taken from steinbok, *Raphicerus campestris* (Thunberg) and springbok, *Antidorcas marsupialis* (Zimmermann), both small South African antelopes. *Antidorcas* reaches southern Angola, while *Raphicerus* extends farther north in East Africa, to northern Tanganyika Territory.

Distribution. — This rare species is known only from the Kalahari, the western Orange Free State and the west-central part of Cape Province. When steinbok and springbok are more carefully examined, the range of the parasite will no doubt be extended.

Synonymy. — *E. binoculus* was described from two males and five females, from the Kalahari. I have not seen the types and I do not know where they have been deposited. The species is, however, easily recognized from the original description and figure.

Characters. — I have only seen one female, received through the kindness of Dr. R. du Toit. The characters given in the key are taken from this specimen. In addition, it may be noted that the chetotaxy is more reduced than in either of the other species: there is only one pair of apical

Fig. 4. *Echestypus binoculus* Speiser. Female, Hoopstad District, Orange Free State. Dorsal (right) and ventral (left) view.

scutellar bristles and the second to fourth median tergal plates bear only one bristle on each side. These tergal plates are, moreover, larger than usual.

Original description of *E. binoculus*: "Länge 3.5-4.5 mm., Mundrand-Hinterrand des Scutellum 2 mm. Kastanienbraun mit einigen helleren Teilen am Kopf, an der Basis der Schenkel und den Schulterecken, die weichhäutigen Teile des Abdomens hell-umberbraun. Kopf rundlich, mit nur wenig verschmälerten Augen, die etwa 1½ mal so hoch wie breit sind. Orbiten sehr breit, fast so breit wie die Augen. Stirnstrieme etwas länger als breit. Lunula ohne Grübchen. Clypeus heller als der übrige Kopf, mit einzelnen braunen Querlinien und einer noch etwas helleren vertieften Mittellinie, die hinten, mitten zwischen den Fühlern, in einem Grübchen endet. Maxillarpalpen, die die Rüsselscheide bilden, kurz. Thorax dorsal wie ventral in Bau und Beborstung sich fast ganz an *Lipoptena* anschliessend. Scutellum mit einem Paar Borsten. An den Beinen fallen die Knie durch etwas dunkleres Braun auf. Ueber Flügelstummel und Halteren siehe die Gattungsbeschreibung. Abdomen bei ♂ und ♀ fast ganz gleich konfiguriert, nur dass beim ♂ die Segmentgrenzen auch ventral ziemlich deutlich sind, während sie beim ♀ hier verwischt sind. Das 1. Tergit ist nur durch 2 derbere Chitinplatten in dem 2. Tergit markiert. Dieses 2. Tergit ist nicht so derb wie bei *Lipoptena*, der Hinterrand bogenförmig, median aber ist er noch bis fast auf seine halbe Länge von hinten her durch eine schmale Kerbe gespalten. Dahinter folgen, den Hinterrändern der Tergite 3-6 entsprechend, 4 unter sich nach Länge und Breite fast ganz gleich gestaltete Chitinplatten; bei den 3 ersten davon ist der vordere Rand nicht gerade, sondern in der Mitte zipfel- oder zahnartig nach vorn vorgezogen. Diese 3 Platten tragen nahe ihrem Hinterrande jederseits eine Borste, die 4., vorn geradrandige bisweilen jederseits 2. Hinter ihr folgt ein Paar am Hinterrande mit vielen Borsten besetzter, fast quadratischer Platten, die zusammen das 7. Tergit repräsentieren; dahinter das weiche Analsegment. Ventral ist ausser dem Basalsegment keinerlei derbere Chitinisierung zu bemerken. Das Basalsternit ist schmal, besteht, (ähnlich wie bei *Echestypus sepiaceus* m.), fast nur aus 2 schmalen, zungenförmigen divergierenden Lap-

pen, die median an ihrer Vereinigungsstelle sich so weit verbreitern, dass das Segment median beim ♀ etwa 1½ mal, beim ♂ fast zweimal so breit (recte lang!) ist wie an den Seiten. Die übrigen Sternite kennzeichnen sich durch etwas dunkleres Chitin und die Stellung der Borsten. Beim ♂ steht jederseits der Genitalöffnung eine kleine, kaum erhabene, mit dünnen Borsten besetzte Warze." ♀ ♂.

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